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THE EFFECTS THAT CAPACITY AND
THE DATES OF HANDLING HAVE ON
MOTOR FREIGHT LOSS AND DAMAGE

presented by

David Steven Kirsch

has been accepted towards fulfillment
of the requirements for

Master's degree in PACKAGING

James W. Goff
Dr. James W. Goff
Major professor

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THE EFFECTS THAT CAPACITY AND THE DATES OF HANDLING HAVE ON MOTOR FREIGHT LOSS AND DAMAGE

By

David Steven Kirsch

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ABSTRACT

THE EFFECTS THAT CAPACITY AND THE DATES OF HANDLING HAVE ON MOTOR FREIGHT LOSS AND DAMAGE

By

David Steven Kirsch

This is a study of the adverse effects that can happen to motor freight when shipped during certain times and with improper capacity requirements.

One year's worth of shipping manifests were collected and analyzed to locate where such problems may occur. Increasing dollar amounts being spent on shipment damages, losses incurred while shipping and/or shortages and overages in the final tally can be decreased with proper shipping knowledge.

A conceptual framework was designed to help distribution networks in locating and eliminating some costs while decreasing others. Test data found that dates shipments were handled and the capacities of trailer loads were significant in loss and damage findings.

ACKNOWLEDGMENTS

The helpful suggestions of Diana Twede, Dr. James W. Goff, of Michigan State University, and Bill Radebaugh, of Preston Trucking Company, during the research and preparation of this thesis are particularly appreciated.

A special appreciation goes to my family and my friends for providing support during this study.

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INTRODUCTION

Within manufacturing and distribution systems loss and damage can and usually does occur. Loss and damage, as well as overages and shortages, happen at all stages of a company's manufacturing process. The fundamental distribution components--procurement, production processing and scheduling, warehousing and material handling, traffic and transportation, and packaging--all at one point or another are involved with the safe movement of materials or goods. The individual performances of these components, as well as their combined efficiencies, are responsible for the amount of overages, shortages, loss and damage occurring to a product or products.

This thesis will address shipping, receiving, and packaging procedures that are prone to overages, shortages, loss, and damage to products. The author shows ways of increasing productivity, reducing costs, improving motivation, eliminating mistakes, and developing a teamwork attitude on the shipping and receiving docks by efficient training, packaging, shipping, palletizing and handling.

A conceptual framework has been designed to explain how, when, and where loss, damage, overages, and shortages may occur. Loss, damage, overage, and shortage can occur in all areas of a procurement to distribution process. This study will try to define the problems that occur in the transportation component. Loss, damage, shortages and overages were found to exist in relatively larger portions than existing literature and interviews had indicated. According to the United States Department of Transportation, loss, damage, shortages and overages do the following.

1. Represent a burden that often can be shifted to other firms.
2. Responsibility for loss, damage, overage and shortage in a single firm is often fragmented.
3. Performance evaluation and other management information systems rarely measure loss, damage, overage, and shortage in their entirety or even separately in individual logistics components.
4. Managements often view loss, damage, shortage, and overage as a tolerable cost that is not worth reducing or eliminating because the cost of such effort appears greater than the benefit to be received (6).

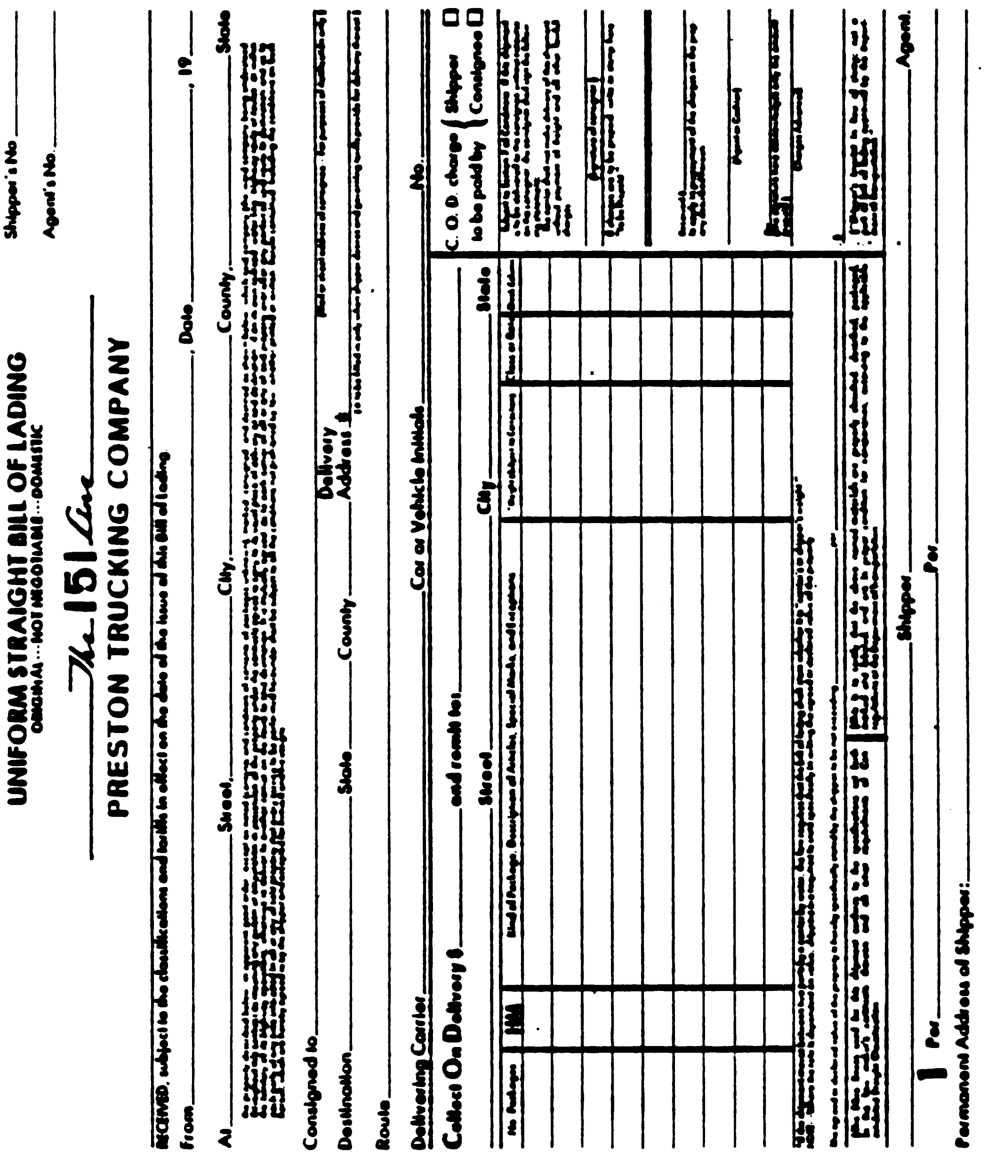
A perspective of the extent of transportation related loss, damage, overage and shortage in the economy is gained when it is considered that:

1. Only a portion of all direct costs are recovered by shippers in claims.
2. Not all claims are paid.
3. Not all loss and damage (overage and shortage) is reported to carriers.
4. Indirect costs are not included in claims.
5. Transportation represents only one of the production logistics components that can and does cause loss and damage (overage and shortage) in the system (7).

Before deregulation freed the carriers from abiding by rules, the Interstate Commerce Commission reported that one of the major areas of complaint received by the I.C.C. involves the settlement of loss and damage (overage and shortage) claims (21).

It is the carrier's responsibility to deliver the goods in the same condition as tendered to it at the point of origin.

All shipments, no matter how small or insignificant, must be accompanied by a bill of lading (Figure 1).
In 1703 in the case of Coggs v. Barnard in England, damage resulted in litigation--Lord Holt stated that


UNIFORM STRAIGHT BILL OF LADING
ORIGINAL—NOT NEGOTIABLE—DOMESTIC
The 151 Line
PRESTON TRUCKING COMPANY

Shipper's No. ____
Agent's No. ____

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading

From ____ , Date ____ , 19__
At ____ Street ____ City ____ County ____ State

Consigned to ____
Destination ____ State ____ County ____ Delivery Address ____
Route ____
Delivering Carrier ____ Car or Vehicle Initials ____ No. ____
Collect On Delivery $ ____ and remit to: Street ____ City ____ State ____
C. O. D. charge to be paid by Shipper ☐ Consignee ☐

No. Packages	Kind of Package, Description of Articles, Special Marks, and Exceptions	*Weight (Subject to Correction)	Class or Rate	Check Column

Shipper ____ Agent ____
Per ____ Per ____
Permanent Address of Shipper: ____

Figure 1

"a delivery to carry or otherwise manage . . . is entered into with one that exercises a public employment . . . and he is to have a reward, he is bound to answer for the goods at all events" (12).

The bill of lading is the basic shipping document used when shipping by common carrier. The bill of lading performs three functions:

1. Receipt for the shipment.
2. Contains the contract specifying the obligations of the carrier and shipper.
3. Serves as evidence of title for the goods being shipped.

Bill of lading as a receipt--Carrier cannot escape liability because of its failure to issue a receipt or bill of lading.

A. The bill of lading provides that the property described is received.

B. The bill of lading describes classifications and tariffs.

C. The bill of lading sees that products are in apparently good order, and that contents and condition of packages are acceptable.

Bill of lading as a contract--Specifies the contracting parties and sets forth the terms and conditions of their agreement. It contains obligations which the carrier assumes. The bill of lading describes the property which the carrier agrees to transport and the bill of lading may name the rates to be applied and the charges to be collected.

Bill of lading as evidence of title--It serves as a documentary evidence of title; as the substitute and symbolic representative of the goods described in the bill and carries the legal title to the shipment, so that a transfer of the bill of lading is a transfer of the goods evidenced by it and possession symbolized by a bill of lading is the same as the actual possession (12, 9).

The freight bill (Figure 2) is merely an invoice of transportation charges. Its phsyical characteristics are as different as there are different means of transportation. The freight bill can be prepaid or collect, depending on the terms of sale between the shipper and the customer. It will identify the shipment and has all the information necessary to determine what rate and total charges should be paid.

RESEARCH METHODOLOGY

A conceptual framework has been designed to investigate the relationship between loss, damage, shortages and overages within the shipping, receiving, and packaging functions of a distribution process.

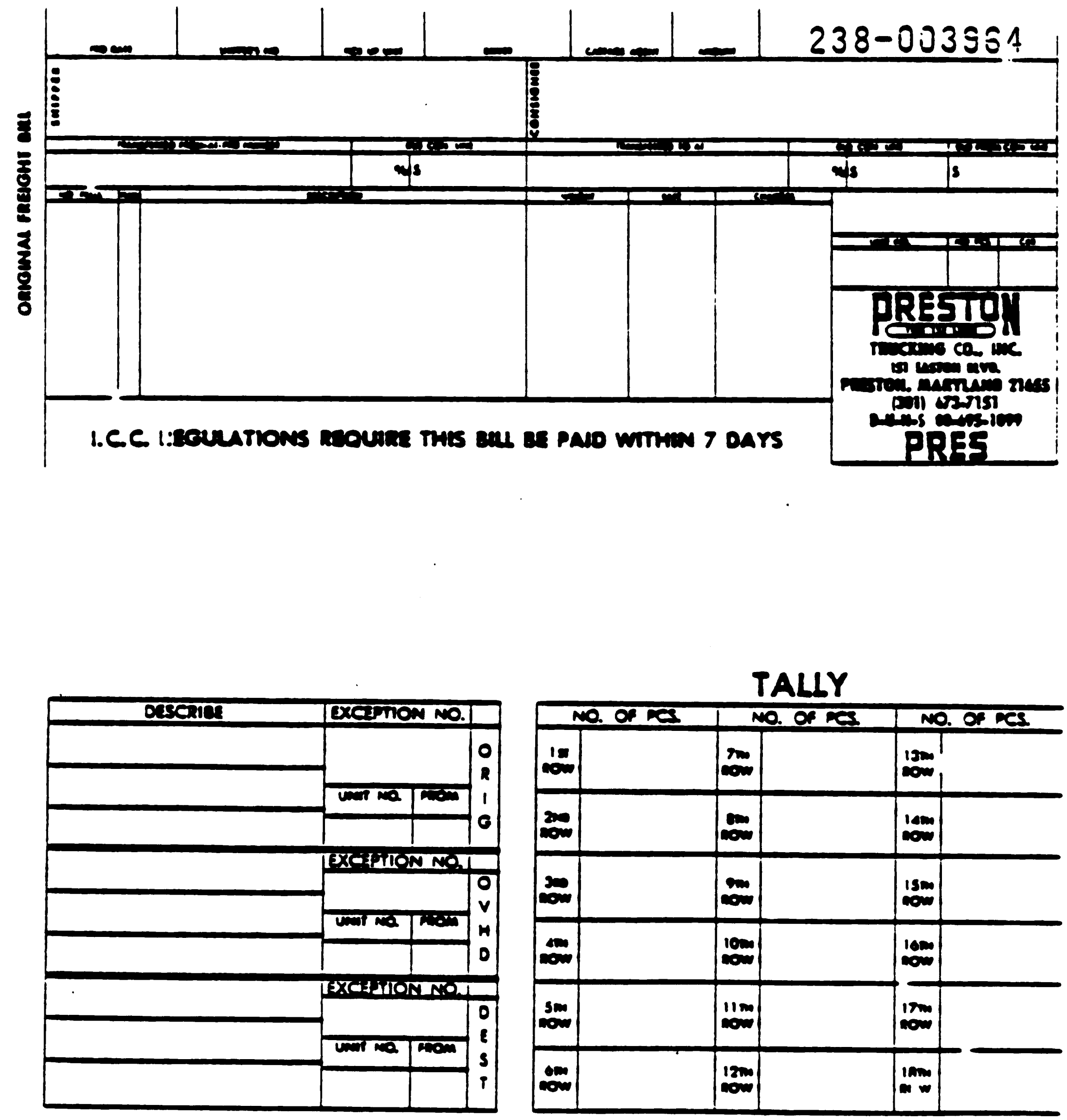

238-003964
ORIGINAL FREIGHT BILL
SHIPPER
CONSIGNEE
PRESTON
TRUCKING CO., INC.
PRESTON, MARYLAND 21655
(301) 673-7151
I.C.C. REGULATIONS REQUIRE THIS BILL BE PAID WITHIN 7 DAYS
PRES
DESCRIBE
EXCEPTION NO.
UNIT NO.
FROM
ORIG
OVHD
DEST
TALLY
NO. OF PCS.
1ST ROW
2ND ROW
3RD ROW
4TH ROW
5TH ROW
6TH ROW
7TH ROW
8TH ROW
9TH ROW
10TH ROW
11TH ROW
12TH ROW
13TH ROW
14TH ROW
15TH ROW
16TH ROW
17TH ROW
18TH ROW

Figure 2

$$\text{Loss, Damage, Shortage, Overage} = f\left(\frac{1}{\text{Training}}, \text{Packaging, Palletizing, Handling, Shipment Size, Dates Handled}\right)$$

The function above is designed to correlate loss, damage, shortage and overage to any one or any number of the parameters given. To clearly understand the model, loss, damage, shortage and overage must be sufficiently defined.

Loss and/or damage can occur in two significant ways. It can be either concealed or visible. Visible damage can be any damage to the product by way of a torn, crushed or damaged package. Generally visible damage is much easier to discern, in that the package or product has obviously been tampered with. Concealed damage is much more difficult to notice. Rattling noises can usually mean concealed damage, but not always. No one knows where the damage occurred. All that is known is that when delivery is made to the ultimate consignee, loss or damage is discovered. The damage could have occurred anywhere in the system. It could have been damaged at point of manufacture, or it could have been damaged by the carrier or carriers transporting to the distributor or warehouse. Products could have been damaged by dock workers doing the outgoing shipments or it could have happened on the last truck ride to the ultimate consignee. It is also possible that the damage happened after the consignee received the goods.

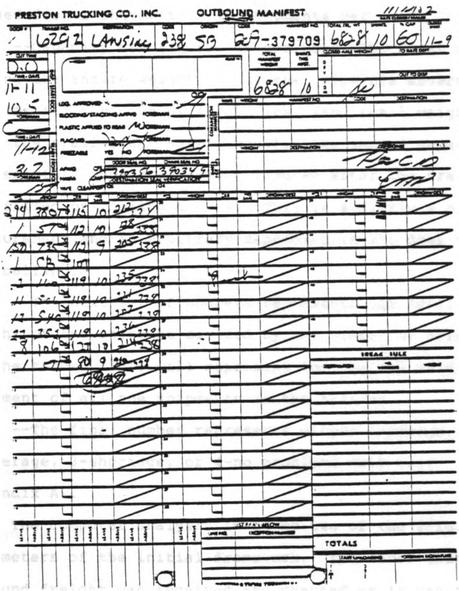
Damage in the shipping environment can be described in a number of ways including crushed, punctured, wet and/or leaking packages. There are as many descriptions of damaged goods as there are goods being shipped.

Along with loss and damage, overages and shortages may occur. Overages and shortages happen most often due to negligence on someone's part. They could be due to misnumbering the cases at shipping time, or misprints on the manifests or any careless act that unthinking shipping personnel are capable of doing.

A COMPUTER ANALYSIS

A computer analysis (Appendix F) was run with one year's worth of randomly selected shipping manifests (247). Each manifest (see illustration) contained important data concerning the shipment which was received by the sampled company (see Appendix A). From the available data the following parameters for analysis were taken: shipment size, dates shipped and handled, capacity, and damage status.

--The date the shipment was sealed at the loading dock and shipped to Point B which is where data was compiled. The second date is the shipment with the



PRESTON TRUCKING CO., INC. OUTBOUND MANIFEST

6292 LANSING 238 59 227-379709 6828 10 60 11-9

6828 10

LOG. APPROVED

BLOCKING/STACKING APPVD

PLASTIC APPLIED TO REAR

PLACARD

FREEZABLE YES NO

APPVD 390356 390349

TOTALS

Figure 3

oldest origin date, meaning the entire shipment's total age from origin of the oldest dated shipment.

--The next set of numbers represents the size of the shipment. How many shipments were in each truck? Numbers ranged from 1 shipment to 40 shipments per load.

--Capacity was figured in two ways. The first was by taking the entire weight of all the shipments aboard the trailer and dividing by 45,000 lbs. (the total weight that the trailer can safely haul). The second capacity represents a cube measurement figured after the trailer was filled on loading dock A. This is strictly a sight measurement and is arbitrary depending on who does the "eyeballing."

--The next set of numbers represents the total weight of the shipment divided by the number of shipments on the truck. This will represent the average weight per shipment of all the shipments in the trailer.

--The final number represents either 1-damage, 2-overage, 3-shortage, or 4-no problems with cargo (see Appendix A).

The computer analysis involved two of the original parameters of the initial framework. The dates that the inbound freight was received and checked as it was taken from the truck, and the size of the individual shipments. Each manifest (see Figure 4) represents an entire truck-load filled with individual shipments. The shipments ranged in size from one individual package to many packages assembled on a pallet.

Dates

The dates that the shipment was received, handled, and/or moved has an interesting correlation to the amount of damage, loss, overage, or shortages reported. The following graphs show that more damage, loss, overages or shortages are apt to take place if a package is handled on a weekend versus a weekday. The least damage, loss, overages and shortages were found to exist in the first two days of the week (Monday & Tuesday). Perhaps as the week progresses the dock workers lose a step or two and tire as the week ends. It was found that the least damage, loss, overages and shortages happened during the colder months of November, December and January; more damage, loss, overages and shortages happened as the spring turned to summer, perhaps as the workers started thinking more of the pleasant weather ahead as opposed to the job at hand. Volume did not differ at different times of the year.

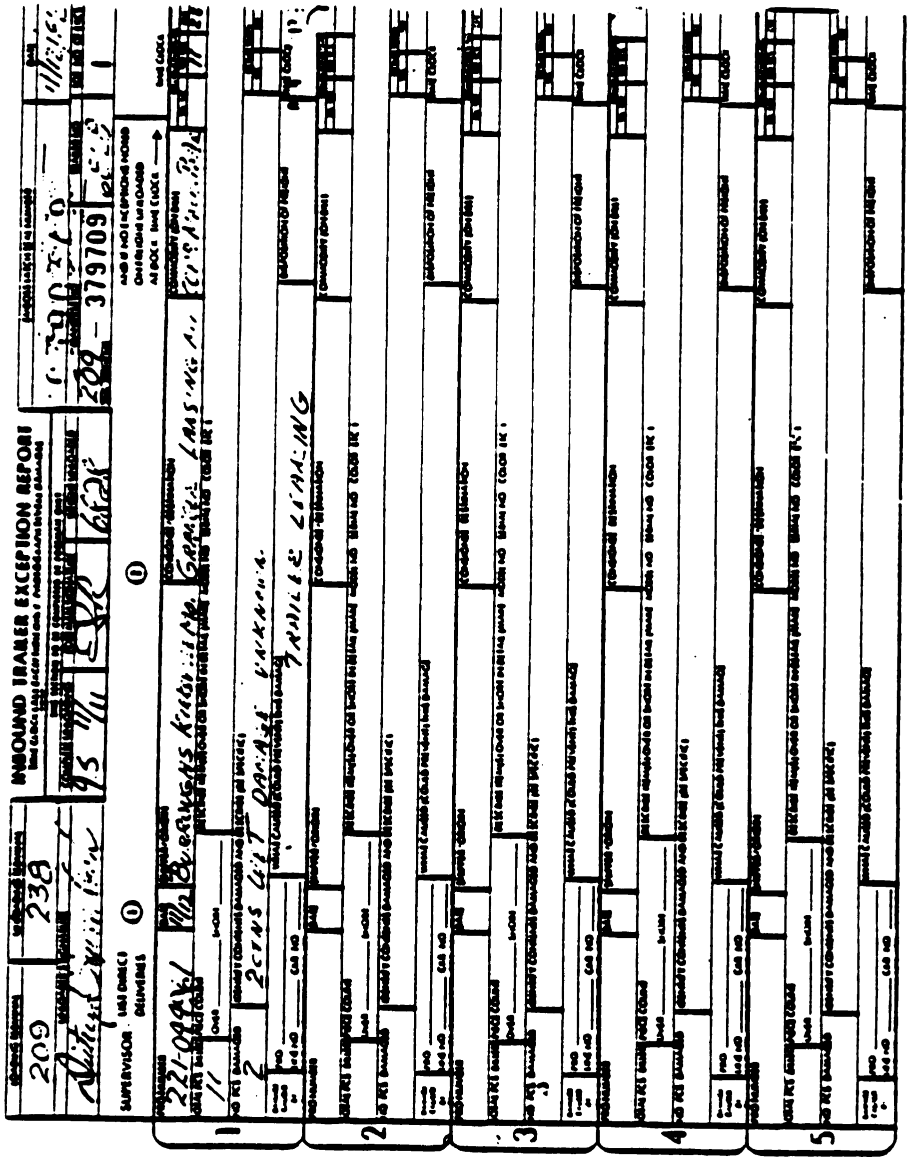


Figure 4

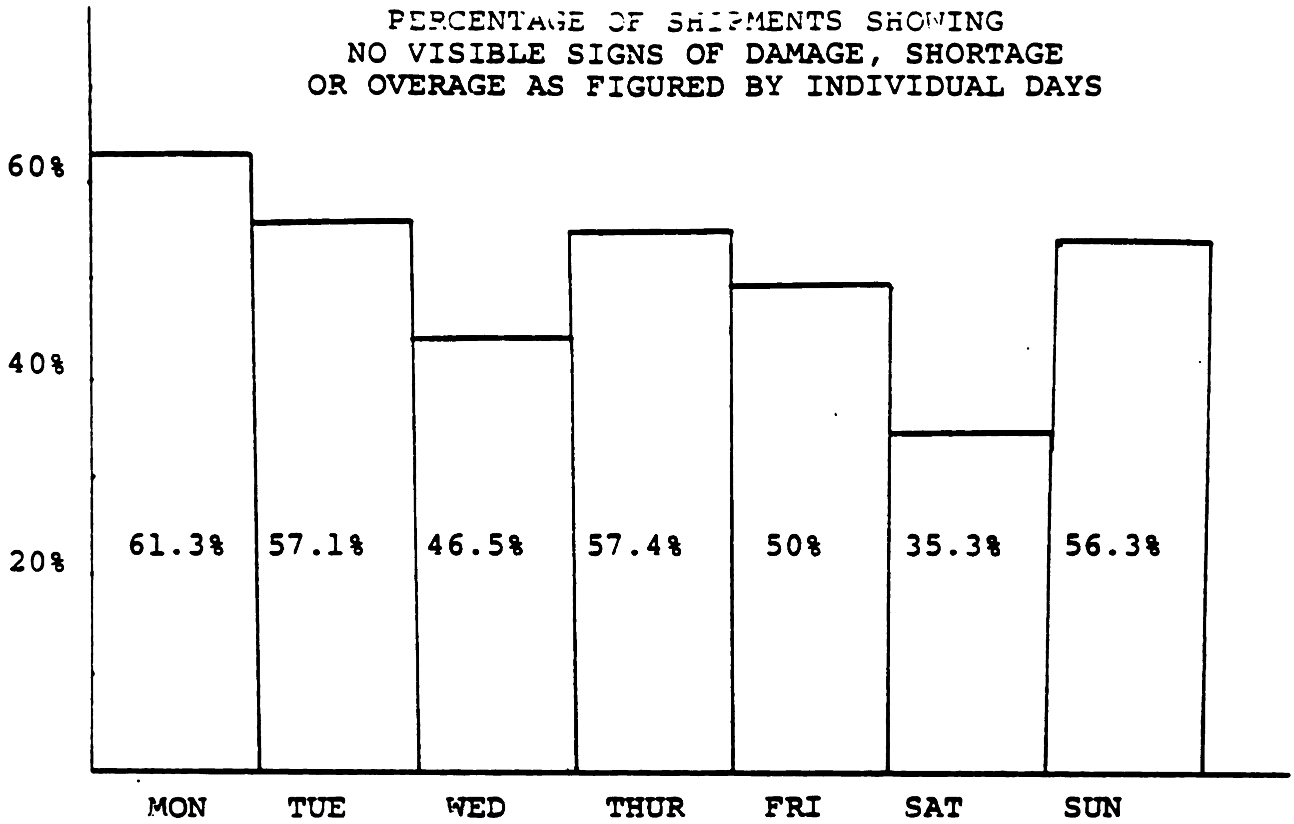
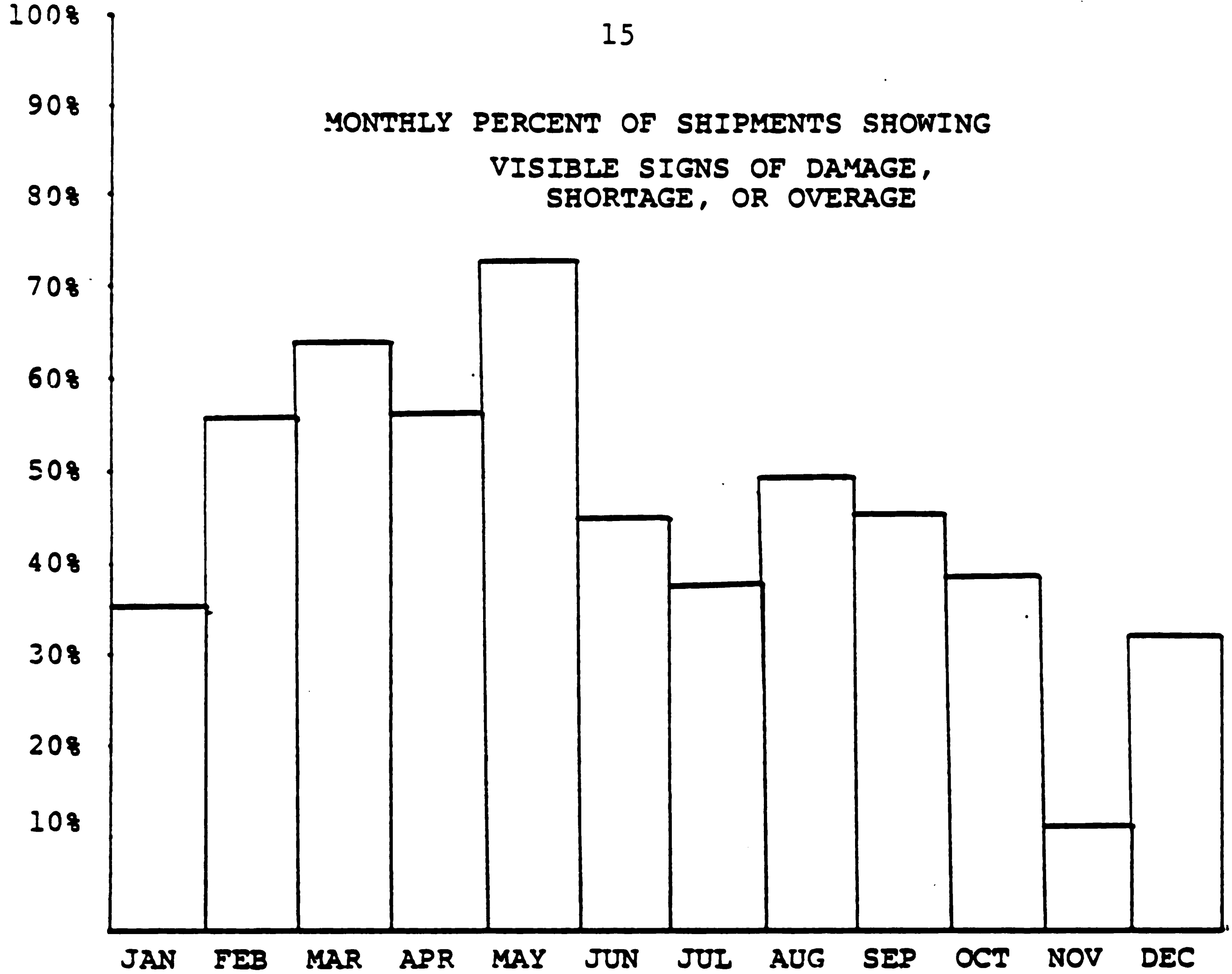


Figure 5

Inbound shipments were received every day of the week including Saturday and Sunday, though shipments were not as constant nor as large as those received on weekdays. The above graph illustrates the percentages of shipments that showed no visible signs of damage, no shortages, and no overages.

Saturday receipts seem to show damage, overage, and shortage occuring more often. Monday shipments appear to have problems less frequently than other days.



Damage, overage and shortages (due to the small amounts of each individually) have been summed together each month and just called discrepancies. Out of 247 truck loads randomly selected, a total of 115 showed visible signs of damage to at least one shipment on the load, and/or a shortage or overage upon counting each individual shipment.

The load represents the entire truckload where the term shipment represents what is used to fill the truck.

Shipment Size

The shipment size was calculated as the number of individual shipments that were loaded onto the trailer for delivery from South Bend, where bulk loads were broken down, to Lansing for final destinations.

Shipment size, or capacity, was broken down into two distinct categories.

The first was cube capacity, which was a volume unit "eyeballed" by the dockworker who loaded the trailer. The capacity is figured as a proportion of a "cubed out" trailer, meaning there is no more room for safely packing another order. The illustration below (Figure 6) can best represent the data found.

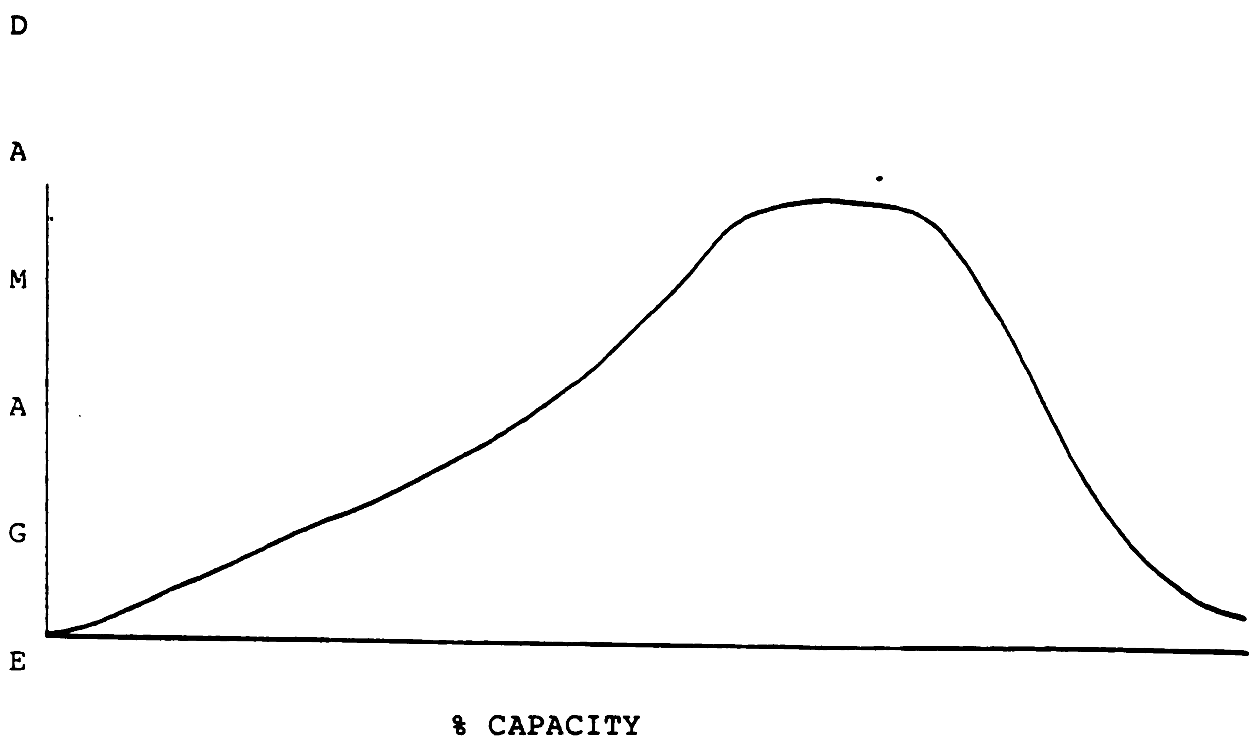


Figure 6

This illustration suggests that with a small load in the truck, damage is less apt to happen because the shipments can be far enough apart to eliminate falling on one another. As more shipments are entered into the system there is more chance of them coming in contact with one another. As the trailer gets closer to 100 percent capacity the shipments can be packed tight enough together to eliminate any falling or crunching of boxes which invariably causes damage and costs time and money.

Analysis of Findings

The conceptual framework designed, based upon the data taken, does indeed work. The actual findings analyzed were a surprise in ways but in others it was as suspected.

First, it was suspected that more damage, overages, and shortages happened when shipments moved on weekends, as opposed to weekdays because more goods were shipped on weekdays. Most workers did not appreciate working overtime on the weekends; so, in turn, their minds were probably not in tune with the work at hand, so more mental mistakes were apt to happen (Appendix B).

Second, it was suspected that more damage, overage, shortage, and losses occurred on Mondays and Fridays, as opposed to the rest of the weekdays, but this did not hold true. In fact, for reasons out of the spectrum of this study, more damage, loss, shortage and overage happened on Wednesday (Appendix B).

Third, it was suspected that as the capacity of the trailer increased, the amount of damage, shortage, overage, and losses would decrease. This was true to a point, as the illustration on the previous page shows, but there was a point where damage increased before it decreased. This is in part due to empty space available in the trailer which would entice objects to fall into or allow for shifting, both of which can cause damage and then losses.

Fourth, as each order was increased it was thought that that individual order would be safer from losses, damage, overages and/or shortages because as the order size increased so did the possibility of the pallet being unitized. As suspected, as the order size increased, the losses, damage, overages, and shortages decreased (Appendix D).

CONCLUSIONS AND RECOMMENDATIONS

Shipment damage, overages, loss, and/or shortages are always going to happen, no matter how careful employees are or how well packaged the product is.

What this thesis is trying to prove is that a large percentage of the loss, damage, shortage or overage can be eliminated by attention to a few of the parameters of the conceptual framework.

A large portion of the reported loss, damage, overage, and shortage can be eliminated by having shipping departments get acquainted with better palletizing techniques. Unitization is a must with companies shipping large amounts of smaller packages. Banding the load to a pallet or wrapping the load to pallet (shrink wrap or stretch wrap), or both, can eliminate high distribution costs. Shortages from packages falling off the stack and/or being left on a dock or loss and damage to a package that gets separated from the lot can be lessened or even eliminated by following a unitization program.

Another method of lessening shipping damage, loss, shortages, or overages is to properly train the personnel who are to do the handling of the shipments. On-the-job training from experienced dockworkers is the best way to initiate the newer workers. Human error seems to be the largest problem with losses. A well-trained dock staff might actually increase productivity through the system, increase distribution efficiency, and even decrease costs by helping to eliminate careless losses, damage, shortages, and overages.

This study shows that shipping on weekends or having the shipment moved on weekends more times than not a negative cost will be incurred. Most people generally do not enjoy working during weekends. Shipments subject to the thinking errors of dockworkers during weekend shipping should be avoided if at all possible.

Legible instructions on each package are a must. A proper U.P.C. code must be shown, as well as a final and initial destination address. Handling instructions are useful as well as helpful but packages not palletized or at least unitized are capable of being mishandled causing losses and damage.

Modern distribution cycles handle between 450 and 650 billion dollars worth of goods now and many millions are paid out in damage claims, not to mention lost business, poor customer service, headaches and other problems. A company can eliminate these problems and decrease their loss, damage, shortage and overage by thinking ahead and preparing their goods for distribution the proper way.

Areas for Future Study

The original equation listed several factors adding to the possible damage of motor freight. Computer analysis was only figured on the handling and shipment size parameters. Other parameters such as training, packaging, palletizing, material handling, and customer service leave a wide open area for further research which was not in the capabilities and time restraints of this study. These are discussed in Appendix G.

APPENDIX A

TABLE 1

		Number of Ship- ments	$\frac{x}{45,000}$ Capacity %	Cap.	Lbs/ Ship.	Discrepancies Damage	Short	Over
1/30 Su	1/25 T	21	39	98	846	x		
1/28 F	1/25 T	22	32	60	649			
1/27 Th	1/24 Mo	15	37	50	1118			
1/26 W	1/18 T	13	22	50	757			
1/25 T	1/21 F	6	28	20	2104			
1/23 Su	1/18 T	29	56	98	870			
1/21 F	1/18 T	18	42	60	1055			
1/20 Th	1/17 M	19	38	70	906			x
1/19 W	1/17 M	8	6	20	340			
1/18 T	1/14 F	6	7	20	576			x
1/16 Su	1/12 W	22	36	50	736			
1/14 F	1/11 T	17	35	50	939	x		
1/13 Th	1/10 M	22	27	25	559	x		
1/12 W	1/7 F	17	14	50	366	x		
1/11 T	1/10 M	2	.003*	5	69			
1/10 M	1/7 F	14	20	50	650			
1/8 S	12/30 Th	19	46	80	1098		x	
1/6 Th	1/5 W	9	23	35	1174			
1/5 W	1/3 M	12	9	40	374			
1/4 T	12/28 T	13	30	40	1068	x		
1/3 M	12/30 Th	2	.008*	5	187			
1/2 Su	12/20 M	26	44	60	760			

TABLE 2

		Number of Shipments	$\frac{x}{45,000}$ Capacity %	Cap.	Lbs/ Ship.	Discrepancies Damage	Short	Over
2/24 Th	2/22 Tu	16	50	60	1396	x		
2/24 Th	2/21 M	17	52	50	574		x	
2/23 W	2/17 Th	12	23	80	854			
2/22 T	2/17 Th	10	27	20	1225	x		
2/20 Su	2/16 W	33	45	85	608	x		
2/18 F	2/11 F	15	27	50	826	x		
2/17 Th	2/10 Th	15	26	40	784			
2/15 T	2/10 Th	7	18	40	1145			
2/18 F	2/14 M	18	97*	95*	2435*	x		
2/13 Su	2/7 M	29	51	90	793			
2/13 Su	2/9 W	7	77	80	4946			
2/11 F	2/7 M	9	10	20	479			
2/10 Th	2/4 F	16	40	60	1114	x		
2/8 T	2/2 W	12	14	25	544	x		
2/9 W	2/4 F	13	33	80	1156			
2/6 Su	2/1 T	31	76	75	1106	x		
2/4 F	1/27 Su	23	34	50	673	x	x	x
2/3 Th	1/28 M	19	45	80	1055	x	x	
2/2 W	1/25 F	12	57	80	2155			
2/1 T	1/26 S	20	46	70	1029	x		

TABLE 3

		Number of Ship-ments	$\frac{x}{45,000}$ Capacity %	Cap.	Lbs/ Ship.	Discrepancies Damage	Short	Over
3/30	2/28	23	51	50	998			
3/30	3/27	14	18	40	577			
3/28	3/22	23	47	70	929	x		
3/26	3/22	21	44	85	942		x	
3/24	3/21	19	23	40	538	x		
3/24	3/21	16	16	50	421			
3/18	3/10	38	47	85	550		x	
3/22	3/18	6	17	20	1252			
3/17	3/14	16	26	60	745		x	
3/16	3/8	23	43	75	836	x		
3/14	3/9	20	43	45	966	x		
3/11	3/7	24	61	95	1139			
3/17	3/8	8	8	10	502			
3/10	3/4	22	20	50	413			
3/8	3/2	16	63	70	1785	x		
3/8	2/28	19	37	70	889	x		
3/5	2/28	13	36	55	1248		x	
3/1	2/25	15	38	50	1128			
3/1	2/23	13	12	30	414	x		

TABLE 4

		Number of Shipments	$\frac{x}{45,000}$ Capacity %	Cap.	Lbs/ Ship.	Discrepancies Damage	/ Short	/ Over
4/30 S	4/19 Tu	14	36	85	1170			
4/30 S	4/25 M	22	45	99	927			
4/28 Th	4/25 M	32	66	90	931			
4/27 W	4/22 F	21	48	85	1024	x		
4/26 T	4/20 W	19	24	50	565	x		
4/24 Su	4/20 W	43	52	75	543	x		
4/21 Th	4/19 Tu	22	27	50	548	x	x	
4/21 Th	4/14 Th	20	44	60	994			
4/20 W	4/13 W	18	25	70	629			
4/19 T	4/15 F	5	15	30	1350	x		
4/17 Su	4/8 F	34	51	80	678		x	
4/15 F	4/11 M	20	23	50	517.7	x		
4/14 Th	4/12 T	19	46	70	1080			
4/13 W	4/5 T	21	39	75	834		x	
4/12 T	3/28 M	21	23	50	494			
4/9 S	4/5 T	15	27	80	817			
4/8 F	3/31 Th	24	17	50	329			
4/7 Th	3/29 T	16	40	50	1127		x	
4/5 T	3/30 W	16	41	70	1157		x	

TABLE 5

		Number of Shipments	$\frac{x}{45,000}$ Capacity %	Cap.	Lbs/ Ship.	Discrepancies Damage	Short	Over
5/31 T	5/26 Th	15	25	45	754			
5/26 Th	5/24 T	21	26	65	569		x	
5/25 W	5/20 F	25	27	50	486	x		
5/24 T	5/27 T	21	39	50	842	x		
5/23 M	5/28 W	27	27	55	446	x		
5/21 S	5/16 M	26	55	90	947			
5/19 Tu	5/16 M	25	36	75	641			
5/18 W	5/16 M	23	41	50	797		x	
5/17 T	5/12 Th	23	38	90	786	x		
5/16 M	5/13 F	4	4	30	463			x
5/13 F	5/1 W	29	84	90	1301	x		
5/14 S	5/11 W	24	39	90	734		x	
5/12 Th	5/9 M	19	27	50	633	x		
5/11 W	5/6 F	27	45	75	747	x		
5/10 T	5/5 Th	14	18	40	573	x		
5/8 Su	5/5 Th	29	56	90	870			x
5/6 F	5/3 T	18	43	90	1080			
5/5 Th	4/19 F	26	59	90	1021		x	
5/3 Tu	5/2 M	21	70	80	1491			
5/3 T	4/28 Th	14	40	80	1285			
5/2 M	4/29 F	13	12	10	416			x

TABLE 6

		Number of Shipments	$\frac{x}{45,000}$ Capacity %	Cap.	Lbs/ Ship.	Discrepancies Damage	Short	Over
6/30 Th	6/28 Tu	28	61	80	983	x		
6/28 T	6/23 Th	22	27	40	546			
6/24 F	6/14 Tu	26	17	45	291			
6/27 M	6/22 W	15	68	30	2032	x		
6/27 M	6/22 W	24	44	90	829		x	
6/22 W	6/20 M	20	55	80	1229	x		
6/21 Tu	6/17 F	12	19	35	8682			
6/20 M	6/16 Th	23	51	75	997			
6/17 F	6/14 T	20	44	90	998			
6/19 Su	6/13 M	23	49	903	963		x	
6/16 Th	6/13 M	24	62	90	1159	x		
6/15 W	6/13 M	27	75	98	1255		x	
6/14 T	6/10 F	16	31	75	871.5			
6/13 M	6/7 T	19	34	70	818			
6/9 Th	6/6 M	14	20	30	649	x		
6/15 S	6/7 Tu	20	54	80	1223			
6/8 W	6/3 F	28	28	80	456	x		
6/7 T	6/2 Th	16	43	70	1215			
6/6 M	6/1 W	17	28	70	748	x		
6/5 Su	6/31 Tu	37	81	90	989	x		
6/2 Th	6/31 Tu	17	28	70	734	x		
6/1 W	5/19 Th	22	30	70	620			

TABLE 7

		Number of Shipments	$\frac{x}{45,000}$ Capacity %	Cap.	Lbs/ Ship.	Discrepancies Damage	Short	Over
7/31 Su	7/26 T	39	39	80	455			
7/28 Th	7/18 M	23	28	60	551	x		
7/27 W	7/19 T	18	27	30	676			
7/26 T	7/19 T	16	26	65	723		x	
7/25 M	7/20 W	24	55	80	1035			
7/24 Su	7/18 M	30	38	95	575			
7/28 Th	7/19 T	15	18	50	545			
7/28 Th	7/15 F	20	24	50	548			
7/19 Tu	7/14 Th	15	55	70	1661			x
7/18 M	7/12 T	28	59	70	949			
7/15 F	6/13 W	36	49	90	612	x		
7/14 Th	7/12 T	16	66	100	1848			
7/13 W	7/11 M	12	27	40	1005			
7/12 T	7/8 F	14	23	50	749			
7/11 M	7/8 F	23	35	50	677	x		
7/7 Th	7/5 T	11	55	90	2267	x		
7/6 W	6/27 W	26	49	80	844			
7/25 S	6/28 Th	28	48	90	772	x		

TABLE 8

		Number of Shipments	$\frac{x}{45,000}$ Capacity %	Cap.	Lbs/ Ship.	Discrepancies Damage/	Short/	Over
8/31 W	8/25 Th	22	63	95	1289	x		x
8/30 T	8/25 Th	17	33	50	866		x	
8/30 T	8/26 F	26	78	85	1354	x		
8/27 S	8/23 T	38	42	90	499	x	x	
8/26 F	8/22 M	27	38	75	630	x		
8/24 W	8/19 F	20	61	99	1371		x	
8/24 W	8/27 M	19	74	80	1757			
8/25	8/19 F	13	23	45	794			
8/19 F	8/17 W	24	58	90	1088			
8/22 M	8/17 W	22	33	75	682			
8/7 Su	8/12 Tu	37	54	90	655			
8/18 Th	8/12 F	34	71	90	944	x		
8/16 Tu	8/12 F	20	46	90	1043			x
8/16 Tu	8/10 W	25	41	75	734		x	
8/12 F	8/9 Tu	15	42	90	1257	x		
8/13 S	8/8 M	18	37	85	928			
8/11 Th	8/5 F	21	27	60	585			
8/10 W	8/8 M	22	47	75	958			
8/9 T	8/4 Th	18	40	40	1004			
8/5 F	8/1 M	28	73	97	1176			
8/7 Su	8/4 Th	18	41	75	1037	x		
8/8 M	8/4 Th	11	16	40	683			
8/4 Th	8/1 M	18	32	95	791			
8/3 W	7/28 Th	19	30	35	708	x		

TABLE 9

		Number of Shipments	$\frac{x}{45,000}$ Capacity %	Cap.	Lbs/ Ship.	Discrepancies Damage	Short	Over
9/29 M	9/26 F	30	52	60	782			
9/27 S	9/22 M	16	23	50	667			
9/28 Su	9/23 T	16	32	50	898			
9/25 Th	9/19 F	10	32	90	1436			
9/24 W	9/21 Su	29	90	85	1392	x		
9/22 M	9/20 S	13	30	50	1040			
9/21 Su	9/16 Tu	24	38	45	706			
9/20 S	9/16 T	13	32	25	1132	x		
9/19 F	9/15 M	22	75	75	1533			
9/17 W	9/14 Su	33	45	80	611			x
9/15 M	9/9 T	21	44	75	944	x		
9/14 Su	9/9 T	30	48	65	724	x		
9/13 S	9/9 T	21	25	50	630			
9/12 F	9/7 Su	10	23	30	1020	x		
9/11 Th	9/7 Su	48	54	90	507			
9/8 M	9/2 T	25	33	85	531			
9/7 S	9/1 M	22	28	40	565	x		
9/31 W	9/30 T	24	36	80	669	x	x	
9/3 W	8/31 Su	33	49	70	669		x	

TABLE 9

		Number of Ship- ments	$\frac{x}{45,000}$ Capacity %	Cap.	Lbs/ Ship.	Discrepancies Damage/	Short/	Over
9/29 M	9/26 F	30	52	60	782			
9/27 S	9/22 M	16	23	50	667			
9/28 Su	9/23 T	16	32	50	898			
9/25 Th	9/19 F	10	32	90	1436			
9/24 W	9/21 Su	29	90	85	1392	x		
9/22 M	9/20 S	13	30	50	1040			
9/21 Su	9/16 Tu	24	38	45	706			
9/20 S	9/16 T	13	32	25	1132	x		
9/19 F	9/15 M	22	75	75	1533			
9/17 W	9/14 Su	33	45	80	611			x
9/15 M	9/9 T	21	44	75	944	x		
9/14 Su	9/9 T	30	48	65	724	x		
9/13 S	9/9 T	21	25	50	630			
9/12 F	9/7 Su	10	23	30	1020	x		
9/11 Th	9/7 Su	48	54	90	507			
9/8 M	9/2 T	25	33	85	531			
9/7 S	9/1 M	22	28	40	565	x		
9/31 W	9/30 T	24	36	80	669	x	x	
9/3 W	8/31 Su	33	49	70	669		x	

TABLE 10

		Number of Ship-ments	$\frac{x}{45,000}$ Capacity %	Cap.	Lbs/ Ship.	Discrepancies Damage/	Short/	Over
10/20 T	10/17 M	33	48	70	660			
10/17 M	10/11 T	21	58	75	1247			
10/19 W	10/12 W	19	38	55	892		x	
10/18 T	10/14 F	14	15	15	492			
10/16 Su	10/11 T	21	60	80	1280			
10/16 Su	10/12 W	13	60	80	2062			
10/13 Th	--	21	39	75	833			
10/12 W	--	16	34	55	948	x		
10/11 T	10/7 F	15	45	65	1346			
10/8 S	--	27	31	50	513	x		
10/8 S	10/4 T	20	67	95	1511	x		
10/6 Th	9/28 W	20	27	50	610		x	
10/4 T	9/29 Th	12	14	25	525			
10/7 F	9/29 S	22	31	75	628	x		
10/3 M	9/28 W	29	62	90	966			
10/2 Su	--	33	49	95	668			
10/31 M	10/26 W	17	14	40	384		x	
10/30 S	10/26 W	22	88	90	1806			
10/30 Su	10/25 T	36	50	90	627		x	
10/27 Th	10/25 T	17	21	70	562			
10/26 W	10/24 M	21	68	90	1468			
10/27 Th	10/24 M	10	70	70	3155			
10/25 T	10/21 F	10	8	20	369		x	x
10/24 M	10/20 Th	25	58	98	1049			
10/23 S	10/18 T	35	49	85	627		x	

TABLE 11

		Number of Shipments	$\frac{x}{45,000}$ Capacity %	Cap.	Lbs/ Ship.	Discrepancies Damage/Short/Over
11/30	11/24	7	05	20	319	
11/28	11/23	27	27	50	446	
11/24	11/16	15	54	45	1625	x
11/23	11/22	7	22	35	1428	
11/22	11/17	17	28	60	745	
11/22	11/19	1	01	3	208	
11/18	11/15	14	37	40	1183	
11/17	11/15	11	22	60	895	x
11/16	11/15	4	15	20	1666	
11/15	11/11	3	17	40	2515	
11/15	11/9	24	31	50	581	
11/12	11/9	10	15	60	683	x
11/11	11/5	22	18	56	366	
11/10	11/8	11	28	40	1140	
11/9	11/5	3	25	35	3798	
11/7	11/3	33	54	95	735	
11/5	10/29	12	21	35	797	
11/4	10/29	.17	16	30	421	
11/2	10/28	3	13	50	1989	

TABLE 12

		Number of Ship- ments	$\frac{x}{45,000}$ Capacity %	Cap.	Lbs/ Ship.	Discrepancies Damage	/ Short	/ Over
12/28	12/22	4	11	20	1204			
12/28	12/27	4	04	10	500			
12/23	12/20	17	68	80	1791	x	x	
12/26	12/22	2	06	20	1526			
12/23	12/16	12	39	40	1482			
12/21	12/14	11	22	20	895			
12/21	12/17	4	05	20	618			
12/17	12/3	14	31	85	1005	x		
12/19	12/14	31	74	90	1079	x		
12/15	12/13	8	47	35	2665			
12/15	12/13	6	14	40	1042			
12/14	12/10	1	03	5	1285			
12/12	12/8	24	17	40	323	x		
12/9	12/7	13	17	30	585			
12/8	12/3	18	15	40	370		x	
12/8	12/6	7	08	20	548			
12/7	12/3	2	04	20	958			
12/6	12/1	22	45	75	931			
12/2	11/29	7	12	30	798			
12/1	11/29	10	14	25	636	x		
12/1	11/24	9	12	40	581	x		

APPENDIX B

ENSCH ANALYSIS 07/13/79 SPSS V9.3 .17.16-25. PAGE 5

ILE NONAME (CREATION DATE = 07/13/79)

. . . . C R O S S T A B U L A T I O N O F . . . .
DAMAGE BY RADAY WEEK DAY RECIVED
. . . . PAGE 1 OF 1

DAMAGE	COUNT / ROW PCT / COL PCT / TOT PCT (RADAY)	Mon 1.	Tue 2.	Wed 3.	Thu 4.	Fri 5.	Sat 6.	Sun 7.	ROW TOTAL
AMAGE	0	13 [illegible]	23 [illegible]	20 [illegible]	21 [illegible]	[illegible]	6 [illegible]	[illegible]	132 53.4
DAMAGE	1.	[illegible]	12 [illegible]	[illegible]	12 [illegible]	[illegible]	[illegible]	[illegible]	73 29.6
OVERAGE	2.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12 4.8
SHORTAGE	3.	2 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	30 12.1
	COLUMN TOTAL	31 12.6	[illegible]	43 17.4	47 19.0	[illegible]	[illegible]	[illegible]	247 100.0

W CHI SQUARE = 13.01775 WITH 18 DEGREES OF FREEDOM. SIGNIFICANCE = .9545

NUMBER OF MISSING OBSERVATIONS = 2

DAMAGE	COUNT / ROW PCT / COL PCT / TOT PCT (RDAY2)	WEEKDAY 1.	WEEKEND 2.	ROW TOTAL
	0	[illegible]	[illegible]	132 53.4
	1.	[illegible]	[illegible]	73 29.6
	2.	[illegible]	[illegible]	12 4.8
	3.	[illegible]	[illegible]	30 12.1
		[illegible]	[illegible]	247 100.0

APPENDIX C

KIRSCH ANALYSIS 07/13/84 SPSS V8.3 .17.16.29. PAGE 15

FILE NONAME (CREATION DATE = 07/13/84)

- - - - - - - - - - - - - - - D E S C R I P T I O N   O F   S U B P O P U L A T I O N S - - - - - - - - - - - - - - -

CRITERION VARIABLE CURECAP CURE CAPACITY
BROKEN DOWN BY DAMAGE

- -

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			15017.0000	60.3057	24.6765	608.9296	(249)
DAMAGE	0		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DAMAGE	1.	DAMAGE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DAMAGE	2.	OVERAGE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DAMAGE	3.	SHORTAGE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TOTAL CASES = 249

KIRSCH ANALYSIS 07/13/34 SPSS V8.3 .17.16.29. PAGE 15

FILE NONAME (CREATION DATE = 07/13/34)

- - - - - - - - - - - - - - - D E S C R I P T I O N   O F   S U B P O P U L A T I O N S - - - - - - - - - - - - - - -

CRITERION VARIABLE CURECAP CURE CAPACITY
BROKEN DOWN BY DAMAGE

- -

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			15019.0000	60.1057	24.6765	608.9296	(249)
DAMAGE	0		[illegible]	[illegible]	[illegible]	[illegible]	([illegible])
DAMAGE	1.	DAMAGE	[illegible]	[illegible]	[illegible]	[illegible]	([illegible])
DAMAGE	2.	OVERAGE	[illegible]	[illegible]	[illegible]	[illegible]	([illegible])
DAMAGE	3.	SHORTAGE	2132.0000	[illegible]	[illegible]	[illegible]	([illegible])

TOTAL CASES = 249

```
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
KIRSCH ANALYSIS                                                 07/13/44    SPSS V8.3    .17.16.25.    PAGE  13
FILE   NONAME   (CREATION DATE = 07/13/44 )
- - - - - - - - - - - - - - - D E S C R I P T I O N   O F   S U B P O P U L A T I O N S - - - - - - - - - - - - - - -
CRITERION VARIABLE   CAPACITY
  BROKEN DOWN BY     DAMAGE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			9067.0030	36.7045	19.1767	367.7490	(247)
DAMAGE	0		[illegible]	[illegible]	[illegible]	[illegible]	([illegible])
DAMAGE	1.	DAMAGE	[illegible]	[illegible]	[illegible]	[illegible]	([illegible])
DAMAGE	2.	OVERAGE	[illegible]	[illegible]	[illegible]	[illegible]	([illegible])
DAMAGE	3.	SHORTAGE	[illegible]	39.[illegible]	15.[illegible]	[illegible]	([illegible])

```
  TOTAL CASES =     249
MISSING CASES =       2 OR    .8 PCT.
```

APPENDIX D

KIRSCH ANALYSIS 07/13/74 SPSS V6.3 .17.16.25. PAGE 12

FILE NOMANS (CREATION DATE = 07/13/74)

- - - - - - - - - - - - - - - D E S C R I P T I O N   O F   S U B P O P U L A T I O N S - - - - - - - - - - - - - - -

CRITERION VARIABLE SHIPSIZE SHIPMENT SIZE
BROKEN DOWN BY DAMAGE

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE		N
FOR ENTIRE POPULATION			4656.0093	18.8502	9.4063	70.6726	(	247)
DAMAGE	0		[illegible]	[illegible]	[illegible]	[illegible]	(	[illegible]
DAMAGE	1.	DAMAGE	[illegible]	[illegible]	[illegible]	[illegible]	(	[illegible]
DAMAGE	2.	OVERAGE	[illegible]	[illegible]	[illegible]	[illegible]	(	12)
DAMAGE	3.	SHORTAGE	677.0000	22.5567	6.6742	44.5709	(	30)

TOTAL CASES = 249
MISSING CASES = 2 OR .8 PCT.

```
KIRSCH ANALYSIS                                        07/13/?4     SPSS V6.5    .17.16.25.     PAGE  17
FILE  NONAME  (CREATION DATE = 07/13/?4 )
- - - - - - - - - - - - - - -  D E S C R I P T I O N   O F   S U B P O P U L A T I O N S  - - - - - - - - - - - - - - -
CRITERION VARIABLE   SHIPSIZE  SHIPMENT SIZE
   BROKEN DOWN BY    DAMAGE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			4656.0093	18.6502	9.4067	70.6726	(2471)
DAMAGE	0		[illegible]	[illegible]	[illegible]	[illegible]	([illegible])
DAMAGE	1.	DAMAGE	[illegible]	[illegible]	[illegible]	[illegible]	([illegible])
DAMAGE	2.	OVERAGE	[illegible]	[illegible]	[illegible]	[illegible]	([illegible])
DAMAGE	3.	SHORTAGE	677.0000	22.3567	6.6742	44.5709	(301)

TOTAL CASES = 249
MISSING CASES = 2 OR .8 PCT.

APPENDIX E

- -

KIRSCH ANALYSIS 07/13/84 SPSS V9.3 .17.16.29. PAGE 14

FILE NONAME (CREATION DATE = 07/13/84)

- - - - - - - - - - - - - - - D E S C R I P T I O N   O F   S U B P O P U L A T I O N S - - - - - - - - - - - - - - -

CRITERION VARIABLE LBSSHIP POUNDS PER SHIPMENT
BROKEN DOWN BY DAMAGE

- -

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			232792.0000	942.4777	547.5533	299814.6900 (	247)
DAMAGE	0		[illegible]	[illegible]	[illegible]	[illegible] (	[illegible])
DAMAGE	1.	DAMAGE	[illegible]	[illegible]	[illegible]	[illegible] (	[illegible])
DAMAGE	2.	OVERAGE	[illegible]	[illegible]	[illegible]	[illegible] (	[illegible])
DAMAGE	3.	SHORTAGE	23553.000[illegible]	[illegible]	[illegible]	[illegible] (	[illegible])

TOTAL CASES = 249
MISSING CASES = 2 OR .8 PCT.

KIRSCH ANALYSIS 07/13/84 SPSS V9.3 .17.16.29. PAGE 14

FILE NONAME (CREATION DATE = 07/13/84)

D E S C R I P T I O N   O F   S U B P O P U L A T I O N S

CRITERION VARIABLE LOSSHIP POUNDS PER SHIPMENT
BROKEN DOWN BY DAMAGE

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			232192.0000	942.4777	547.5533	299814.6908	2470
DAMAGE	0		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DAMAGE	1.	DAMAGE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DAMAGE	2.	OVERAGE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DAMAGE	3.	SHORTAGE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TOTAL CASES = 249
MISSING CASES = 2 OR .8 PCT.

APPENDIX F

CROSSTABS ANALYSIS 07/13/7? SPSS V?.3 17.16.23. PAGE 3

FILE ?ONAM (CREATION DATE = 07/13/7?)

. . . . C R O S S T A B U L A T I O N O F . . . .
DAMAGE BY RMONTH MONTH RECEIVED
. . . . PAGE 1 OF 2

DAMAGE	COUNT / ROW PCT / COL PCT / TOT PCT	JAN 1.	FEB 2.	MARCH 3.	APRIL 4.	MAY 5.	JUNE 6.	JULY 7.	AUGUST 8.	SEPTEMBE 9.	OCTOBER 10.	NOVEMBER 11.	DECEMBER 12.	ROW TOTAL
[illegible]	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DAMAGE	1.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
OVERAGE	2.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SHORTAGE	3.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	COLUMN TOTAL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

CONTINUED

- - - - - - - - - - - - P E A R S O N   C O R R E L A T I O N   C O E F F I C I E N T S - - - - - - - - - - - -

	SHIPSIZE	CAPACITY	LOSSHIP	CUBECAP
SHIPSIZE	1.0000 ([illegible]) P= .	[illegible] ([illegible]) P= .001	[illegible] ([illegible]) P= [illegible]	[illegible] ([illegible]) P= [illegible]
CAPACITY	[illegible] ([illegible]) P= .001	1.0000 ([illegible]) P= .	[illegible] ([illegible]) P= .001	[illegible] ([illegible]) P= [illegible]
LOSSHIP	[illegible] ([illegible]) P= .001	[illegible] ([illegible]) P= [illegible]	1.0000 ([illegible]) P= .	[illegible] ([illegible]) P= [illegible]
CUBECAP	[illegible] ([illegible]) P= .001	[illegible] ([illegible]) P= .001	[illegible] ([illegible]) P= .001	1.0000 ([illegible]) P= .

(COEFFICIENT / CASES / SIGNIFICANCE)   (99.0000 MEANS UNCOMPUTABLE)

KIRSCH ANALYSIS 07/13/84 SPSS V9.3 17.16.25. PAGE 16

CPU TIME REQUIRED.. .179 SECONDS

T-TEST GROUPS=DAMAGE2(1,2)/ VARIABLES=SHIPSIZE TO CUBECAP/

0035300 CM NEEDED FOR T-TEST

KIRSCH ANALYSIS 07/13/84 SPSS V9.3 17.16.25. PAGE 17

FILE NONAME (CREATION DATE = 07/13/84)

- - - - T - T E S T - - - -

GROUP 1 - DAMAGE2 EQ 1.
GROUP 2 - DAMAGE2 EQ 2.

VARIABLE	NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	F VALUE	2-TAIL PROB.	POOLED VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.	SEPARATE VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
SHIPSIZE SHIPMENT SIZE												
GROUP 1	134	17.1045	9.789	.753	1.35	.103	-3.63	247	.000	-3.67	246.97	.000
GROUP 2	115	20.8793	7.514	.701								
CAPACITY												
GROUP 1	134	33.9051	19.181	1.657	1.05	.793	-2.43	247	.016	-2.43	242.93	.016
GROUP 2	115	39.8435	16.721	1.746								
LOSSHIP POUNDS PER SHIPMENT												
GROUP 1	134	949.6194	697.246	58.914	2.73	.090	1.51	247	.131	1.57	223.33	.110
GROUP 2	115	834.3522	391.731	36.529								
CUBECAP CUBE CAPACITY												
GROUP 1	134	56.9209	25.729	2.223	1.10	.198	-2.70	247	.007	-2.73	245.99	.007
GROUP 2	115	65.1739	22.552	2.103								

KIRSCH ANALYSIS 07/13/84 SPSS V9.3 17.16.25. PAGE 18

CPU TIME REQUIRED.. .111 SECONDS

PEARSON CORR SHIPSIZE TO CUBECAP 39

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                                                        07/13/74     SPSS VR.3    .17.16.25.     PAGE    1
VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 4.2  NSU  MAY 4, 1972


100000 CM MAXIMUM FIELD LENGTH REQUEST

          RUN NAME        HIRSCH ANALYSIS
          VARIABLE LIST   AMONTH,ADAY,[illegible],LMONTH,LDAY,LWDAY,SHIPSIZE,CAPACITY,
                          LOSSHIP,CUBECAP,DAMAGE
          INPUT FORMAT    FIXED([illegible],A1,F2.0,F1.0,A1,F2.0,F1.0,F2.0,F3.0,F[illegible].0,F2.0,
                          F1.0)

          ACCORDING TO YOUR INPUT FORMAT, VARIABLES ARE TO BE READ AS FOLLOWS

          VARIABLE   FORMAT   RECORD    COLUMNS

          AMONTH       A       1         [illegible]
          ADAY       F 2.      1         [illegible]
          AWDAY      F 1.      1         [illegible]
          LMONTH       A       1         [illegible]
          LDAY       F 2.      1         [illegible]
          LWDAY      F 1.      1         [illegible]
          SHIPSIZE   F [illegible]      1         [illegible]
          CAPACITY   F [illegible]      1         [illegible]
          LOSSHIP    F [illegible]      1         [illegible]
          CUBECAP    F [illegible]      1         [illegible]
          DAMAGE     F 1.      1         [illegible]

THE INPUT FORMAT PROVIDES FOR  11 VARIABLES.   11 WILL BE READ.
IT PROVIDES FOR  1 RECORDS ("CARDS") PER CASE.
A MAXIMUM OF    23 "COLUMNS" ARE USED ON A RECORD.

          N OF CASES      UNKNOWN
          MISSING VALUES  ALL(BLANK)
          RECODE          AMONTH,LMONTH([illegible])
                          [illegible]
          COMPUTE         AWDAY2=AWDAY
          RECODE          AWDAY2(1 THRU 5=1)(6,7=2)
          COMPUTE         LWDAY2=LWDAY
          RECODE          LWDAY2(1 THRU 5=1)(6,7=2)
          COMPUTE         DAMAGE2=DAMAGE
          RECODE          DAMAGE2([illegible])
          VAR LABELS      AMONTH,[illegible]/
                          [illegible]
                          [illegible] ON DECK/
                          [illegible]
                          [illegible] ON DECK/
                          [illegible]
                          LOSSHIP,[illegible]/
                          CUBECAP,CUBE CAPACITY/
          VALUE LABELS    AMONTH [illegible]
                          [illegible]
                          [illegible]
                          ADAY,[illegible]WEDNESDAY[illegible]
                          [illegible]
                          DAMAGE [illegible] PROBLEMS/
                          [illegible]
                          DAMAGE2 [illegible]

CPU TIME REQUIRED..      .111 SECONDS

          [illegible]    [illegible] BY AMONTH,AWDAY,AWDAY2,LMONTH,[illegible],LWDAY2
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APPENDIX G

APPENDIX G

The following are brief discussions of possible findings which could aid management in future studies of loss and damage in a shipping environment.

Training

The people who are directly responsible for truck loading are often some of the lowest status in the distribution channel (17).

Training is inversely proportional to the amount of loss, damage, overages and shortages in a distribution system. An employee with more training can obviously foresee problems that may occur in the act of shipping and receiving. Good judgment at all times by the drivers and loading dock employees will far outweigh carelessness and lack of motivation. The workers on the dock have the final responsibility for the product as it leaves the origin of the trip. Kicking containers to wedge them into a stack or crawling or walking over the load can damage the product as much as a load shift (16).

The following is a checklist which can aid drivers and loading foremen:

1. Cleaning and General Maintenance
    a) Has the vehicle been swept or washed to remove dirt or odors?
    b) Have protruding nails, screws, or staples been removed or driven in?

2. Loading

   a) Has a load pattern suitable for the product and type of container been determined?

   b) Has the load been blocked and braced as needed to prevent shifting and ultimately damage (16)?

The way in which the dock handlers are trained is very important. Different organizations obviously have different methods of handling freight, loading and unloading trucks, and what to keep an eye out for. Training programs are now available to educate dockworkers on the tribulations of the distribution process. Though these training programs are very helpful they do not teach the methods that dockworkers can only experience on the job. Training programs, movies, and/or slide shows do not give the individual worker enough practical education to work a loading/receiving dock.

Packaging

Packaging must protect the product through the distribution process (2). Packages serve three basic functions. The most important of these is the function of providing protection for the contents. The need for a package to fulfill such a function implies that risks are involved and hazards are present (5). These hazards are commonly known as physical handling and transportation as well as environmental factors. The latter can be in many forms such as rain, relative humidity, temperature extremes, or atmospheric pollution of all types. Other hazards posed by the human environment are those of theft and misdirection due to carelessness (shortage and overage).

A second package function is that of providing containment to facilitate transportation, storage, and use. Containment is essential to the protection function in the sense that it implies the continued integrity of protection provided by the package (5).

The third function of a package is that of communication. Packages commonly carry information, such as "Handle with care," "Fragile," "This side up," or "This side down." The nature of the information depends on the purpose of the package. Some of the most important printing on packages is the address to where it is being sent and from whence it came. Also as important in the warehouse and like distribution channels is the U.P.C. code which can give entire shipping and other pertinent information. Without these two the package will surely be devoid of a proper finish in the cycle.

Reflection on these functions will reveal that they are intimately interrelated. If the containment function is inadequately provided for, the protective cushioning or barrier surrounding the product may be lost and damage may result as the product travels through a distribution system. The same loss of the outer package may also result in a failure of the communication function, if that part of the container which failed carried the name of the intended recipient. The net result may easily be a damaged product with an unknown source and destination (5).

A poorly designed package without the basic properties to withstand the rigors of the distribution process will also fail, causing losses and damage far beyond the thoughts of the manufacturers. Shipments will ultimately be moved, stacked, dropped, hit and pushed--a package must be designed with these parameters in mind.

Palletizing

Standardization and unitization are two distinct methods of decreasing or even eliminating loss, damage, overages, and shortages in a fundamental distribution process. These are two examples of how shipments can be palletized.

Standardization

Standardization facilitates materials movement. It is a method in which a package design can be used so that all measurements of further packaging, machinery, materials handling, transportation techniques, and any other measurements that are connected with the original package are in increments of that original package's measurements. Standardization is a concept and physical distribution is no exception for the inception of just such an idea. It should not be taken to the extreme of increasing costs beyond a limit that would be economical to the firm. Standardization should be understood as the fewest practical number of types, makes, models, or sizes. The most important concept in standardization is the size of the package and the way in which that package size will coincide with the other of the same size to increase economies of distribution. Standardization of equipment and trucks is a costly concept which will follow closely behind the idea of package standardization (5).

Costs can be cut by the use of standardization by decreasing loss, damage, shortage, and overage. It can make counting of loads easier, and handling much more efficient by decreasing the bulky loads.

Pallets would be in a tighter load, and there would be less chance of an odd size package dropping on a more fragile shipment or falling and breaking itself. Standardization, though costly to implement, would save companies money in the long run due to increased ease in handling, both physical and mechanical. Few companies can change to standardization without years of preparation. Pallets, trucks, and even loading docks must be changed to adhere to the standard sizes. Companies that indeed do standardize their packages may lose out on the even numbers they have been using in the past, like 12, 24 or a 48 count. A better cube/weight ratio is available per pallet load and can receive a better rate from the carriers--if, of course, those particular carriers who would transport standardized loads, are equipped to handle them (5).

Standardization can be counterproductive, because it can eliminate the healthy competition between packagers and, consequently, reduce innovation. Standardization is a two-edge sword, with fascinating short-term implications of cost savings; but, the long-term spectre of suppressing incentives is something that should also be considered (25).

Unitization

Professor James R. Bright defines a unit load as:

> a number of times, or bulk material, so arranged or restrained that the mass can be picked up and moved as a single object, too large for manual handling, and which upon being released will retain its initial arrangement for subsequent movement. It is implied that single objects too large for manual handling are also regarded as unit loads (3).

A unit load could mean anything from a truck load to a handful, provided they adhere somewhat to the above definition.

Glen R. Johnson, Jr., laid down these parameters towards a unit load description (3):

1) A unit load should decrease number of handlings and eliminate manual handling
2) Assemble materials into a unit load as soon as possible and keep it in that form for as long as possible.
3) Assemble materials into a unit load for economy of handling and storage
4) When necessary, redesign packages or cartons for better assembly into unit loads and retain the

unit load form to use all possible cube space and prevent product damage.

5) Make the unit load as large as possible considering the limitations of building, materials handling equipment, production areas, volume of material required, and common carrier dimensions and capacities.

The unit load has many advantages and disadvantages that must be weighed when deciding on a method of transfer of goods. Decreases in loss, damage, shortages, and overages of shipments depend on handling precision during all aspects of the procurement to distribution process. Some of the advantages to using unit load methods are below.

1) Permits handling of larger loads
2) Decreases handling costs
3) Faster movement of goods
4) Decrease time for loading and unloading
5) Decrease packaging costs
6) Maximize use of cubic space
7) Decrease pilferage in transit and storage
8) Decrease product damage
9) Better customer service
10) Safer handling (3)

Unit loads can be formed any number of ways. Most unit loads are palletized. The pallets are then either banded, with metal or plastic slats, shrink wrapped in a heat shrinkable film, or wrapped in a stretchable film. In all cases the idea is to decrease the number of objects per shipment. In certain shipments which involve a number of small cases the chances of all of those cases of that particular shipment reaching the final destination in good condition increases as the unit load is formed.

For example, in the case of the dockworker having to handle 25 pieces of one particular order, the chances of the worker miscounting all the pieces (or damaging one of the 25 pieces) is high. With the unit load concept, all 25 pieces would be attached together whether wrapped or banded to a pallet. This would mean that the worker would only have to count one piece (the loaded pallet) and handle one piece. The unit load most definitely decreases loss, damage, overages and shortages in distribution systems.

Disadvantages of the unit load method include:

1) Cost of unitizing
2) Cost of de-unitizing
3) Different equipment is required
4) Carrier vehicles are not uniform in size

Unitization is related to modularization, which is the process of integrating the sizes and shapes of many different packages so that mixed loads can be more effectively unitized.

By wrapping a pallet with either a shrink or a stretch wrap and then banding the load to a pallet, shipments with many orders can be handled without fear of loss. What this unitizing does is eliminate the counting of the orders each time the shipment is received at different docks. For instance, if one shipment contains 200 boxes, a dockworker must account for all 200 by counting them and signing the receipt of such order. Humans make mistakes and the count could be short or over depending where in the trip the shipment is. This can be eliminated by wrapping and/or banding.

In another example, while using the same shipment with the same 200 pieces, but placing this shipment in the truck with other unbanded and unwrapped pallets, the truck then experiences some speed bumps and pot holes so the next dockworker opens up the trailer and finds a big pile of mixed up shipments on the floor of the truck. This increases costs and decreases productivity and efficiency in the system. This problem too may be eliminated by wrapping or banding or both.

Palletizing methods, like unitization, standardization, and modularization, have the ability to make or break a company. By exercising the correct procedures, loss, damage, shortage and overages do not have to happen. Acts of God (i.e., tornados, floods, etc.) will take their toll but common mistakes should not occur.

Material Handling

Handling involves the picking up and putting down of the package, moving it in any plane or combination of planes by any means (3).

Packages are moved physically and/or mechanically. Pallet loads, properly palletized, may be moved by a forklift. Problems can arise when a pallet is not stacked properly, causing the load to shift or swing. Problems also happen when the palletized load is not held down either by being wrapped (stretch or shrink) or banded (metal or plastic straps). Unitized pallet loads can lose items during transit time, careless handling or palletizing. Unitizing by banding or wrapping the load can virtually eliminate this problem. A nonunitized load can come up with shortages due to items being dropped or pushed off while in transit. A small box that falls off the pallet is subject to shock damage in a number of ways. The package can fall and the contents could be damaged--or it can fall and be crushed as the load shifts at any time on the highway.

Packages can also be moved by hand with a hand truck or dolly, if they are small enough and light enough.

Listed below is a partial guideline for the selection of handling methods as listed in Materials Handling Systems Design (3).

No Equipment	Equipment
1. Low volume	A. General
2. Low rate of flow	1. Loads over 50 lbs (or other predetermined limit)
3. Nonuniform flow	
4. Small items	
5. Short distances	2. Two-man handling tasks

6. Limited area
7. Infrequent handling
8. Occasional handling
9. Varying paths
10. Small percentage of time spent in handling
11. No alternative

3. Traveling time exceeds lifting and placing time

B. Manual

1. Relatively light loads
2. Limited volume
3. Physical restrictions
4. Limited capital
5. Wide variety of handling tasks (requiring flexibility of manual equipment)
6. Low-cost operation

Customer Service

Customer service can be considered the measure of how well the physical distribution system is performing in creating time and place utilities for a product. Four main categories of customer service performance are:

1. Time: Order-cycle time.
2. Dependability: Consistency and reliability, accuracy, and quality of goods on arrival.
3. Communications: Feedback on expectations and deviations from the norm, on information flow from order through invoice, and on order reminders.

4. <u>Convenience</u>: In ordering, information flow, materials handling, shipments, schedules, carriers, and ability to cancel or complain (9).

Customer service is different for as many different customers that need to be served. The Ronald and Ronald Willett work in customer service analyzes it from the customer's point of view to include the following:

1. Order cycle length
2. Consistency of order cycle length
3. Order preparation
4. Order accuracy
5. Order condition
6. Order size
7. Order frequency
8. Billing accuracy
9. Billing efficiency
10. Back orders
11. Claims (7, 9)

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